

CALCULATIONS OF COSMOGENIC NUCLIDE PRODUCTION RATES IN THE EARTH'S ATMOSPHERE AND THEIR INVENTORIES; Keran O'Brien, Environmental Measurements Laboratory, New York, N.Y. 10014

The production rates of cosmogenic isotopes in the Earth's atmosphere and their resulting terrestrial abundances have been calculated, taking into account both geomagnetic and solar-modulatory effects.

The local interstellar flux was assumed to be that of Garcia-Munoz, et al. (1) Solar modulation was accounted for using the heliocentric potential model (2) and expressed in terms of the Deep River neutron monitor count rates. (3) The geomagnetic field was represented by vertical cutoffs calculated by Shea and Smart (4) and the non-vertical cutoffs calculated using ANGRI. (5)

Variations in geomagnetic field strength were modelled by changing the magnitude of the vertical cutoffs in proportion to the change in the magnitude of the geomagnetic field strength.

The local interstellar particle flux was first modulated using the heliocentric potential field. The modulated cosmic-ray fluxes reaching the earth's orbit then interacted with the geomagnetic field as though it were a high-pass filter.

The interaction of the cosmic radiation with the earth's atmosphere was calculated utilizing the Boltzmann transport equation. (6) Spallation cross sections for isotope production were calculated using the formalism of Silberberg and Tsao (7,8) and other cross sections were taken from standard sources.

Inventories were calculated by accounting for the variation in solar modulation and geomagnetic field strength with time. Results for many isotopes, including C-14, Be-7 and Be-10 are in generally good agreement with existing data. The C-14 inventory, for instance, amounts to  $1.75 \text{ cm}^{-2} \text{ s}^{-1}$ , in excellent agreement with direct estimates. (9,10)

#### REFERENCES

1. Garcia-Munoz, M., Mason, G. M. and Simpson, J. A. (1975) Ap. J., 202, pp. 265-275.
2. Gleeson, L. J. and Axford, W. I. (1967) Ap. J., 147, pp. L116-L118.
3. O'Brien, K. and Burke, G. de P. (1973) J. Geophys. Res., 78, pp. 3013-3019.
4. Shea, M. A. and Smart, D. (1967) J. Geophys. Res., 72, pp. 2021-2027.

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O'Brien, K.

5. Bland, C. J. and Cioni, G. (1968) Earth Planet. Sci. Lett. 4, pp. 339-405.
6. O'Brien, K. (1975) Natural Radiation Environment II, USERDA rep. CONF-72085, pp. 15-54.
7. Silberberg, R. and Tsao, C. H. (1973) Ap. J. Supplement Series 25, pp. 315-333.
8. Silberberg, R. and Tsao, C. H. (1973) Ap. J. Supplement Series 25, pp. 335-367.
9. Grey, D. (1974) PhD Thesis, Univ. of Ariz., Univ. Microfilms, Ann Arbor, Michigan.
10. Damon, P. E., Lerman, J. C. and Long, A. (1978), Ann. Rev. Earth Planet. Sci., 6, pp. 457-494.